NATURAL RESOURCE MANAGEMENT

5180

CIP Code: 03.0299

This course is a year long program that provides students with a background in natural resource management. Students are introduced to career opportunities in natural resource management and related industries, the history of the forest industry and forest policy, the importance and uses of forest plants, factors that influence the development of forests, forest improvement and best management practices, proper care and use of forest tools and equipment, effects of management practices on the environment, soil conservation practices, water and its importance to natural resource management, hazardous waste management, native wildlife, waterfowl, fish, wetlands and pond management, surveying and map use, management of recreational areas, outdoor safety, and weather. "Hands-on" learning activities encourage students to investigate areas of environmental concern including: identification and management of ecosystems, management of waste, chemicals and the environment, soil conservation, land uses, regulations, and ordinances, water quality, and air quality.

- Suggested Grade Levels: 10-12
- Recommended Prerequisite: None
- A two credit/two semester course.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Competencies and learning activities defined.
- This course is included as a component of the Agriculture and Natural Resources career cluster.

Natural Resources Management

A. Students shall investigate the opportunities and requirements for employment in natural resources management and related industries.

1. Examine specific job titles and briefly explain their job responsibilities and duties.
2. Identify post-high school educational institutions offering natural resource courses.

B. Students shall analyze the historical and regional perspective of the forest industry and forest policy in Indiana and the United States.

1. Identify major forest areas in the United States and list a major marketable species in each area.
2. Identify major marketable timber species in Indiana, and the primary and secondary wood products.
3. Organize historic trends of land use and forest changes in Indiana leading to current forested acreage.
4. Evaluate the economic impact and cultural practices used in the production of Christmas trees, maple syrup, orchards and landscape nurseries.
5. Identify Indiana hardwoods that are highly valued firewood.

C. Students shall evaluate how forest plants provide watershed protection, recreational opportunities, domestic needs, and food and cover for wildlife.

1. Define forest components as related to the needs of wildlife.
2. Cite recreational uses of the forest and forest plants.
3. Analyze the relationship between forest conditions and water quality.
4. Examine products that originate from Indiana forests.
5. Define the term urban forestry and explain the significance of urban trees to human communities.

D. Students shall differentiate the factors which influence the growth, vigor, and occurrence of forest species and the methods of classifying trees.

1. Differentiate between biotic and abiotic site factors and relate how annual precipitation, seasonal temperature fluctuation and soil site index influence plant growth.
2. Compare and contrast dominant and suppressed trees and identify suppressed trees that have release potential.
3. Predict simple successional changes on a given site.
4. List the major forest types in Indiana.

5. Define silvicultural and dendrology.
6. Demonstrate correct tree planting techniques.
7. List external and internal parts of a tree and describe the function of each.
8. Demonstrate proficiency in using a dichotomous key to identify trees and shrubs.
9. Differentiate between angiosperms and gymnosperms.
10. Identify on sight common trees native to Indiana.
11. Identify on sight common forest insect pests and common diseases, the damage they cause and methods of prevention and treatment.
12. Compare the historical impact of major insect or disease occurrences in Indiana and the eastern U.S. (e.g., Dutch Elm Disease, Chestnut Blight, Gypsy Moth, etc.)
13. Discuss current genetic research to improve tree growth rate and resistance to insects and disease.

E. Students shall integrate the methods used in timber stand improvement, timber harvesting and forest management for multiple use.

1. Define the terms timber stand improvement, sustained yield and multiple use forest management, and list components considered in multiple use/multiple benefit land management.
2. Describe silvicultural practices used to manage and harvest the forest and demonstrate proper selection, marking and measurement of trees for harvest.
3. Determine the volume of a log using the appropriate volume table and log scale stick.
4. Evaluate features that are important in the identification of lumber, and examine defects of wood which affect lumber quality.

F. Students shall identify forest tools and demonstrate safely their proper use and maintenance.

1. Identify and explain the use of major forestry hand and power tools, including all safety precautions and equipment.
2. Perform maintenance operations on each of these tools including sharpening and handle replacement.
3. Identify the parts of a chain saw, calculate proper oil/fuel mixture and demonstrate safe maintenance procedures.
4. Operate a chain saw safely while correctly felling, limbing, bucking, and brushing.

G. Students shall develop and exhibit communication skills which are important for natural resource managers.

1. Examine the need for communication skills in the natural resources professions.
2. Describe the important features of a descriptive, interpretive and persuasive presentation.
3. Exhibit proper introduction techniques.
4. Make an oral presentation appropriate to a given situation.
5. Write a presentation on a natural resource topic.

H. Students shall integrate interrelated aspects of the environment in proposing resource management practices.

1. Define ecology.
2. Define and provide examples of environmental conservation, preservation, exploitation and stewardship.
3. Propose an example of biotic succession.
4. Analyze a basic food chain, including the transfer of energy through the chain.
5. Evaluate an instance where people have altered the local and/or global balance of nature and give positive and negative results.
6. Give an example of how an ecological succession can be altered so it will remain at a secondary stage rather than advancing to the climax stage, and how this action affects production.
7. Identify agencies at the county, state and federal levels with environmental management responsibilities.

I. Students shall evaluate problems confronting human life as the finite amounts of non-renewable natural resources are depleted and the area for production of renewable natural resources becomes limited.

1. Define the terms renewable and non-renewable resources and provide examples of each.
2. Evaluate the effects of population growth on the environment.
3. Examine problems relating to resource management resulting from local population shifts from rural to urban and vice versa.
4. Hypothesize future needs and uses of energy related to business, industry, and population, and how energy conservation practices could be implemented locally, regionally and statewide.
5. Discuss positive and negative features of nuclear, solar, water, wind, geothermal, animal waste, wood, and fossil fuel powered energy and consider how these features affect policy making as it is related to these natural resources.

J. Students shall analyze soil conservation practices.

1. Define soil erosion.
2. Describe major factors causing soil erosion and the consequences of uncontrolled erosion.
3. Analyze characteristics of plants commonly used in resource conservation, their applications and identify local sources for purchase.

K. Students shall identify air pollutants, describe their effects on the environment and evaluate methods of control.

1. Prepare list of air pollutants and their characteristics, identify local sources of air pollutants and perform air monitoring techniques.
2. Evaluate several air pollution control methods, and identify the laws and regulations enacted to control air pollution.

L. Students shall evaluate the importance of water, its major uses, and management practices related to water resources.

1. Describe the hydrologic cycle and define the terms aquifer, evaporation, surface water, ground water, flood plain, water table, and watershed.
2. Investigate the distribution of the world's water supply and what percentage is usable.
3. Identify the major uses of water in Indiana including the amounts used for industry, agriculture, and private consumption and compare these uses with other parts of the country.
4. Determine the major watersheds of Indiana.
5. Analyze the properties of surface water and ground water and how contaminants move and react in water.
6. Compare the differences between point and non-point source pollution, and demonstrate techniques used to determine water quality.
7. Identify types of waste water and discuss techniques used to reclaim waste water.
8. Examine the management of wastewater in an agricultural setting, including disposal of waste water from livestock operations and how a septic system works.

M. Students shall examine the identity, handling, storing, disposal, and safety of hazardous materials.

1. Identify hazardous materials and discuss safe handling, storage and disposal procedures for these materials.
2. Assess governmental regulations concerning the safe handling, storage and disposal of hazardous materials.

N. Students shall identify common species of fur-bearing wildlife of Indiana and recommend wildlife management practices.

1. Identify on sight fur-bearing animals indigenous to Indiana and describe their life cycles.
2. Define wildlife management, habitat, native wildlife, exotic species, and migration.
3. Examine the impact of agriculture on wildlife populations, recommend methods to improve wildlife habitat and recognize the concepts of "edge", "biodiversity", "habitat", "food chain", and "niche".
4. Define the term population curve and demonstrate how reproduction and morality affect the curve.
5. Evaluate hunting and fishing regulations including the scientific basis for such restrictions.

O. Students shall assess the importance of predators and endangered species, and the roles each plays in the natural community.

1. Define endangered species, predators and threatened species and list examples of each.
2. Examine possible causes of extinction.
3. Analyze management strategies that have repopulated endangered and threatened species.

P. Students shall analyze the characteristics and management of waterfowl.

1. Define drake, duck, hen, gander, goose, gosling, dabbling (puddle) duck, and diving duck.
2. Describe the characteristics of waterfowl, including family name, habitat, characteristics of the young and life cycle.
3. Diagnose the purposes of waterfowl management and evaluate techniques used in such management.
4. Define waterfowl migration and list the major flyways in North America.
5. Be able to identify on sight species of waterfowl that migrate through Indiana and species that winter in Indiana.

Q. Students shall analyze the characteristics and management of Indiana fish.

1. Classify fish according to their place in the food chain, including plant eaters, plankton feeders, insect eaters, omnivores and predators.
2. Illustrate the physical characteristics used to identify fish species.
3. Explain the proper role of stocking in managing fishery resources and identify fish species propagated in Indiana hatcheries.

4. Identify the habitat requirements and life cycles of representative warmwater and coldwater fishes, and hypothesize how fish habitat may be altered.

5. Evaluate the economic and recreational values of Indiana's fishery resources.

6. Illustrate the management practices used to raise fish in ponds or hatcheries.

R. Students shall demonstrate ability to use and care for surveying equipment, and be proficient in the use of maps.

1. List applications of surveying in natural resource management.

2. Set up and maintain a complete field notebook.

3. Set up and adjust a level, take a reading on a rod and use a theodolite to determine angles and distances.

4. Calculate and determine within third order precision the difference in elevation between two points using single wire leveling.

5. Orient a map with a compass, find a given field location by using a map and a compass and perform basic land measurements including pacing and chaining.

6. Compare the relationship between azimuth and bearings, and locate a given point on a map with azimuths and distances.

7. Describe the location of a parcel of land in terms of the Federal System of Rectangular Surveys, including the legal description based on section, township, and range.

8. Interpret a topographic map key and convert map distance to ground distance.

9. Explain the difference between astronomic north and magnetic north.

10. Explain how Indiana state boundaries and section boundaries were established.

S. Students shall examine general aspects of recreational area management and associated employment opportunities.

1. Identify the positive features of a recreational area in terms of safety and use.

2. Describe differences between the four recreational area types (neighborhood, community, regional and state) and uses which are encouraged and discouraged at each.

3. Evaluate career opportunities in the national and state park systems, including basic duties, requirements, and educational prerequisites.

4. Identify recreational situations requiring written rules, discuss problems of user controls and law enforcement in recreational areas, and discuss solutions to these problems.

5. Identify and discuss negative environmental consequences which may result from inappropriate use of off-road recreation vehicles.
6. Demonstrate knowledge of the "Rules of the Waterway", identifying navigational markers and demonstrating a knowledge of their meanings.
7. Describe the practical and educational prerequisites for occupations related to water recreation management.

T. Students shall exhibit safety procedures and be prepared to handle minor emergency situations that may arise in an outdoor location.

1. List and explain general safety procedures to be followed when dealing with people in groups.
2. Exhibit the ability to build a fire, extinguish a fire, and eliminate all traces of the fire.
3. Describe the procedure to be taken when attempting a water rescue.
4. Explain and demonstrate how to avoid and give emergency care for shock, venomous bites or stings, broken bones, hypothermia, and hyperthermia.
5. Describe the value of layering when dressing for cold weather, and the proper clothing needed and appropriate behavior for protection from rain, snow and extreme heat and cold.
6. Select the safest and most comfortable camping site protected from the elements.

U. Students shall examine the basic components of weather systems and their effects on resource management and rural recreation.

1. Distinguish between weather and climate.
2. Demonstrate how to read a barometer, anonometer, maximum/minimum thermometer, rain gauge and hygrometer.
3. Define relative humidity and explain its importance in resource management.
4. Analyze the role the jet stream plays in determining the weather pattern.
5. Examine the effect that low pressure, high pressure, warm fronts and cold fronts have on weather conditions.